Course	**Discipline Specific Core**
Semester	VI
Paper Number	MBTCR6132T & MBTCR6132P
Paper Title	BIO ANALYTICAL TOOLS
No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory + 4 Practical
Course description/objective	The course aims to 1. provide an overview of various technical methods and bio-analytical tools which have useful applications in biotechnology. 2. introduce students to microscopy, centrifugation and cell fractionation techniques. 3. introduce students to electrophoresis and its applications. 4. enable students understand the principles of chromatography. 5. introduce students to the principles of spectroscopy. 6. provide students with a hands-on-experience of several bio-analytical techniques in the practical module.
Syllabus	**Theory** **Module A: (20 marks)** **UNIT I:** Simple microscopy, phase contrast microscopy, fluorescence microscopy**.** Centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles. **UNIT II:** Introduction to electrophoresis, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, pulse field gel electrophoresis, immuno-electrophoresis, isoelectric focusing, Western blotting and immunoprecipitation to study protein-protein and protein-nucleic acid interaction. **No. of Classes:** 1.5 Classes per week **Module B: (30 marks)** **UNIT III:** pH meter, absorption and emission spectroscopy, Principle and law of absorption, spectrophotometry (visible, UV, infrared), colorimetry, fluorimetry, Concept of NMR and CD (outline only). **UNIT IV:** Introduction to the principle of chromatography. paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC. **No. of Classes:** 2.5 Classes per week **Practical** 1. Preparation of buffers. 2. Native gel electrophoresis of proteins 3. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions. 4. To verify the validity of Beer's law and determine the molar

	extinction coefficient of NADH. 5. Estimation of protein concentration by Modified Lowry Method. 6. Monitoring protein aggregation using turbidity measurements and gel electrophoresis 7. Selective salting out of proteins using ammonium sulfate precipitation Practical tutorials: 1. Preparation of the sub-cellular fractions of rat liver cells. 2. Preparation of protoplasts from leaves. 3. Separation of amino acids by paper chromatography. 4. To identify lipids in a given sample by TLC.
Readings	1. P. S. Kalsi, Spectroscopy of Organic Compounds, New Age International, 2007. 2. C. N. Banwell, & E. M. McCash, Fundamentals of Molecular Spectroscopy, Tata McGraw-Hill: New Delhi, 4th edition, 2006. 3. Lehninger Principles of Biochemistry - Cox & Nelson. 4. Biochemistry Berg – Tymoczko & Stryer.
Evaluation	Theory: Continuous Internal Assessment: 10 marks End-Semester Theory Examination: 50 marks Practical: Continuous Internal Assessment: 32 marks End-Semester Examination: 8 marks
Paper Structure for End Sem Theory	Module A (20 Marks) Compulsory Objective questions: 1x6 = 6 marks Subjective two questions 10 marks each: 2x7 = 14 marks Module B (30 Marks) Compulsory Objective questions: 1×6 = 6 marks Any two from three subjective questions with subparts: 12×2 = 24 marks (No subpart will be less than 1 mark or more than 5 marks)